

BRAIN, PERCEPTION, ACTION

Brain, Perception, Action (This flyer will be updated soon)

Offered by	Department of Industrial Engineering and Innovation Science
Language	English
Primarily interesting for	All students, but most relevant for Computer Science and Engineering, Industrial Design, Electrical Engineering, Industrial Engineering and Management Sciences, Biomedical Engineering, Medical Sciences and Technology, Architecture, Building and Planning, and Mechanical Engineering
Prerequisites	Introduction Psychology and Technology (Q1, OHV10) is recommended as prior knowledge, but is not required.
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Content and composition

Many students are interested in developing technologies that will eventually be used by a human end-user. Such technologies could include smart cars, intelligent lighting systems, digital games, interactive robots, smart homes, or medical systems, to name but a few. What these systems have in common is that, ideally, they should be designed based on knowledge about their prospective end-users, their capabilities and limitations, needs and preferences, expectations and habits. In order to provide a basis for the successful design of human-centred systems and environments, we need a solid understanding of the brain bases of behavior, the perceptual and motor processes by which humans interact with their environment, and the design principles and processes by which technological systems and artifacts can be constructed to be optimally tailored to the characteristics of their end-users. In this course series, you will learn about how the brain works, how it serves perception and action, and how to utilise this knowledge as a scientific basis for designing the technological environments in which we live and work.

Course code	Course name	Level classification
OHV40	Brain Body Behavior	2. Intermediate
OHV20	Perception and Motor Control	3. Advanced
OHV100	Human Factors	3. Advanced

Course description

Brain, Body, Behaviour

The human brain is the most complicated structure known to man: one hundred billion neurons (give or take a few), each one connected to around 10,000 other neurons. It is estimated that more than half of the genes in the genome are used in building the brain, far more than are used for any other organ system. And neurons make up only 10% of cells in the brain. If you want to know what the other 90% are up to, you will want to attend. Brain, Body, Behavior, where we address important ideas and principles in neuroscience, such as the brain's building blocks (What is the brain made of? How is it organized?), functional specialization (How does the brain process information? Which brain area does what?), and 2 brain plasticity (How does the brain learn and adapt? How and to what extent does it recover from damage?). After this course, students will also have an appreciation of the intimate connections between brain, body and mind, and should be able to understand the role of technology in brain science, as well as understand the basic mechanisms and current limits of brain-computer interfaces and neurorobotics.



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Perception and Motor Control

The fact that our skull is packed with complex tissue does not explain how that tissue makes us smart. For this, we will also need a higher level of abstraction, that of information processing and adaptive behavior. Perceptual processes and skilled motor behaviors are so automatic that we generally have a hard time appreciating their complexity. They suffer from the “anesthetic of familiarity” as the biologist Richard Dawkins has called it. The second course in this series, Perception and Motor Control, will effectively counteract that anesthetic. After this course, you will have a deeper understanding of the perception-action cycle: how we sense the world as well as our own bodies through several sense organs, how our brains process this information, combining it with prior knowledge, making decisions, and sending commands to our motor systems. In turn, our actions affect the environment which trigger new percepts – a continual perception-action cycle.

Human Factors

Of course, things become even more interesting when technology becomes part of the perception-action cycle, and we throw cognition, affect, and social factors in the mix as well. In the third course of the series, Human Factors, we will study how to design technological artifacts, systems, and environments in such a way that they support and enable the human brain to do what it does best. Students will learn about the principles and processes that govern the ways in which humans interact with technological products, systems and services. The role of fundamental technical interactive components, e.g., displays or controls, and of complex processes and interfaces, e.g., in medical environments, transportation, or advanced human-computer interaction (HCI), are highlighted based on properties of human perception and action, models of cognition and communication, and empirical performance data. In addition, you will become acquainted with the design processes by which both simple and more complicated technological systems and artifacts can be constructed to optimally address the capabilities, limitation, needs, and expectations of their users.